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Progress Report
Contract Nonr-609(02)
covering the period
1 October to 31 December 1953

31 December 1953
Edwards Street Laboratory
Yale University
New Haven, Connecticut

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SUMMARY REPORT

1. The quarter here reviewed was unusually cluttered up with administrative details and did not produce any impressive array of either experimental or theoretical results. Just before it began the annual shift from high to low activity in field testing had occurred, on 16 September, and throughout the quarter the regression, not to say retreat, at the Beavertail Laboratory occupied an important part of the time of administrative people. The net reduction of personnel, as shown in Annex A, was about forty per cent, and this has thrown additional tasks on survivors. An effect of a high rate of separation which may not occur to everyone is that the taking of earned leave actually cuts the force down more rapidly than statistics in Annex A suggest. The occurrence of the holiday period in the last quarter of the calendar year also decreased its relative performance.

2. Work under sub-contracts was not affected by the situation mentioned in paragraph one, but two unexpected occurrences have delayed progress. The antenna built under sub-contract by Scientific Associates and installed at Beavertail early in September began to come apart spontaneously during October, numerous screws holding curved plates to the rotating structure popping off their heads at an increasing rate. (It must have been over-designed because even as thus weakened it

weathered a couple of gales.) First attempts at repair by contract personnel and, subsequently, by CB's specially detailed for three weeks from Davisville, did not keep pace with deterioration, and at the close of the quarter arrangements had been made for replacement of screws by the supplier early in January. The other difficulty with a sub-contract was uncovered by an inspection of progress at Melpar, Inc., made by Dr. Patterson and Dr. Watson on 21 December 1953. It appeared to these investigators that the complexity of the "bread-board" model of an underwater warning device then nearing completion would be so great as to make it unsuitable for extensive use outside harbor entrances as originally considered possible. A method of saving the investment already made in this work was under discussion at the end of the quarter.

3. The Harbor Defense Research Unit fluctuated considerably during the quarter. Together with temporarily assigned enlisted men of special ratings for diving, for metal work (antenna repair), and for surveying, a peak strength of two officers and seventeen men was reached by 1 November 1953. Two months later, at the close of the quarter, the Unit was again at low ebb, with only two officers and one enlisted man. One of the officers (Lt. R.S. Edwards, USNR.) had received orders detaching him early in the following quarter. Boats and

trucks assigned to Beavertail activities on a full-time basis had also decreased in number, and principal dependence is now upon temporary availability of such vehicles arranged for specified operations at the convenience of both Contract and Naval participants. The principal operations requiring Naval assistance during the quarter were air drops on 21 October (3 Mines Mark 39) and on 3 December (3 Mines Mark 36) and use of a YSD from the Naval Air Station, Quonset Point on several occasions for underwater maintenance work on fixed installations and for simulation of mine splashes by spray from fire-fighting hose.

4. The change, on 15 December, in methods of classifying documents containing what was until then termed "Security Information" is still requiring extra work from clerical and administrative personnel, and will continue to do so until things settle down to the new routine. The Contract continues to be hampered by delays in obtaining secret security clearances for employees who have not spent their entire lives in preparing for espionage by leading colorless lives in one place.

5. The disposition of equipment becoming surplus as particular sub-projects finished their experimental phases required a good deal of attention because during the build-up period a number of short-cuts had been tolerated and re-

tracing these through incomplete and scattered records presented some puzzling questions. This confusion has now been satisfactorily resolved.

6. During the quarter the Study Group, which had held its first meeting on 18 September, held eight more seminar-type meetings with pre-announced topics (see Annex B for details) and its Program Committee met more frequently. A number of specific recommendations have been made (see Annex C) and a more general report will shortly be issued as a basis for planning for the following two quarters, that is, through the current termination date, and for any possible extension of the Contract thereafter.

7. The Director's activity as a member of the Mine Advisory Committee has been less during this quarter than in the next preceding quarters. Only one meeting of the MAC has been held during the period under review, inWashington on 23 and 24 November. The Director visited the Naval War College Library three times during the quarter to consult documents not elsewhere easily available. Captain Dench used the same library more frequently. Other Contract personnel have consulted with interested groups in the Office of the Chief of Naval Operations, and in the Bureau of Ships in Washington on mine countermeasures, in the Eastern Sea Frontier Office in New York City, on [illegible] layer tracking, in the National Defense Research Com-

mittee in Washington, D.C. on U.E.P., in the Atomic Energy Committee in Washington on special weapons countermeasures, and in several research laboratories partly or wholly supported by the research program of the Armed Forces on these and other matters. Visits to ESL or EL by personnel from the British Joint Services Mission, the Office of the Chief of Naval Operations, the Hydrographic Office, the Navy Electronics Laboratory, and the Naval War College have been stimulating and informative.

L.W. McKeehan
Director

Contract Nonr-609(02) Progress Report 31 December 1954

ANNEX A

Personnel

Working days paid for by Contract. (Figures after dash are working days at Beavertail Laboratory.)

		-1953- Oct.	Nov.	Dec.
	Administration - General			
1.	L. W. McKeehan	22-12	21-10	23-16
2.	H. D. Hauf	22-2	21-1	23
3.	Maude Purdue	22	21	23
4.	S. Z. Bear	22		
5.	R. V. Vallera	22	21	23-2
	Administration - Beavertail			
6.	Virginia Withington	22-22	21-21	23-23
7.	Miriam Newbauer	22-22	21-21	23-23
	Technical Service Supervision			
8.	C. S. Robinson	22-22	21-21	23-23
9.	A. A. Fisher	22-22	21-21	7-7
10.	F. G. Timperley	22-2	21	23
	Technical Staff			
11.	R. E. Barrett	22-22	21-4	23
12.	E. R. Beringer*	-	-	-
13.	C. H. Dench	4.5-3.5	4	4.5-1.5
14.	A. A. Evett	5.5	5.5	6
15.	H. A. Fairbank*	-	-	-
16.	D. D. Foster	22	21	23
17.	W. R. Guild	5.5-1	5.5	6
18.	F. Hutchinson	5	4.5	5
19.	R. W. Jackson	22-5	21-2	23
20.	C. T. Lane	3.5	3.5	3.5
21.	H. A. Lepper, Jr.*	-	-	-
22.	C. T. G. Looney*	-	-	-
23.	J. K. Major	5.5	5.5	6
24.	M. S. Malkin	22	21-3	23-2
25.	H. Margenau*	-	-	-
26.	C. W. Miller	3.5-3.5	3.5-2.5	4-3
27.	L. Onsager	2.5	2.5	2.5
28.	W. C. G. Ortel	22-5	21-10	23-5
29.	A. Patterson, Jr.	4-1	3.5	4
30.	G. F. Pieper, Jr.*	-	-	-

* Unpaid

		-1953- Oct.	Nov.	Dec.
31.	E. C. Pollard	3	2.5	3
32.	W. Rall	5	4.5	5
33.	F. G. Robley*	-	-	-
34.	H. L. Schultz	3.5	3.5	3.5
35.	W. W. Watson	2.5	2.5	2.5-1
36.	M. L. Wiedmann	3.5	3.5	3.5
37.	H. J. Wiens*	-	-	-
	Technical Assistants			
38.	C. F. Andersen	22-22	21-21	
39.	R. G. Bennett	11-2	10.5	11.5
40.	S. D. Elliott, Jr.	11-1	10.5	11.5-1
41.	G. W. Landwehr	11	10.5	11.5
42.	D. P. Mann	11-1	10.5	11.5-1
43.	M. J. Rosenblum	11	10.5-3	11.5-2
44.	D. H. Sampson	11	10.5	11.5
45.	M. S. Steinberg	11		
46.	P. H. Sutter	11	10.5	11.5
47.	A. D. Voorhis	11	11.5	9.5
48.	R. P. Whorf	8.5	11.5	12.5
	Technical Service Assistants			
49.	F. A. Barone	22-5	21-1	23-1
50.	J. H. Bowen, 2nd	22-22	21-21	15-15
51.	M. C. Carrano	22-1	21	23
52.	J. F. Dorflein	22-22	21-21	
53.	C. I. Hudson	22-22	18-18	
54.	L. E. O'Connell	22-22	21-21	
55.	W. C. Phelps	22-2	21	23-2
	Clerical and Custodial Service Assistants			
56.	Ann Anastasiou	22	21	23
57.	N. J. Anton	22-6	21-5	23-2
58.	A. J. Bausman	22-22	21-21	
59.	Doris Crawford	7.5	10.5	23
60.	Phyllis Downing	22	21	23
61.	H. V. Griswold	22		
62.	Elizabeth Hutchinson	11	10.5	11.5
63.	F. L. Jones	22-22	21-21	23-23
64.	Regina Lawn	22	21	23
65.	D. J. Soares, Jr.	22-22	21-21	23-23
66.	Marion Sprague	7		
67.	Jo Ann Vaughn	22-22	21-21	

* Unpaid

ANNEX B

REVIEW OF SUB-PROJECTS AND OF RELATED ACTIVITIES

1. ARRANGEMENT OF SUBJECTS

The numbered and lettered heads and sub-heads of this review are arranged in the order used in the last quarterly progress report, except as indicated.

2. LONG-RANGE LOCATION OF AIRCRAFT-LAID MINE ENTRY POINTS

a. Radar Mine-Spotting

(1) The specially designed and constructed radar set for mine splash location on the highest tower at Beavertail was tested on realistic targets only once during the quarter, on 21 October. A small amount of data on sea clutter was obtained, but more data are needed. As explained in the Summary a great deal of time has been spent on reconditioning a defective element, the antenna dish, and at the close of the period the set was still inoperative. Components needed for a change in photographic recording and for other small changes are ready for installation, and a program of further mine drops has been agreed upon and still appears feasible during the succeeding quarter. A seminar on this sub-project was led by Dr. W.R. Guild at a Study Group Meeting in ESL on 8 December. A report is in preparation.

(2) The completely distinct sub-project on fixing

desiderata for a distance-only non-scanning radar of low cost, even in needed multiple applications, has been tried out both on mine drops, on 3 December, and on spray clouds thrown by a "fire-boat" YSD, on 22 December. Neither of these tests gave assurance of target acquisition in operational use because the standard radar receiver components used were saturated by targets actually picked up instead of maintaining the open scale of response from strong targets required for the proposed rejection of steady or slowly changing targets. The offending components have been redesigned and are being reconstructed. Only simple tests will be needed to settle the moot point still remaining. A change in frequency in this set will allow simultaneous use of both radars in further tests, to economize operating time and to give comparable results by the two methods.

b. Visual Mine-Spotting

Report is listed in Annex C. No further tests are proposed.

c. Photographic Mine-spotting

A seminar on photographic mine-spotting was led by Dr. C.W. Miller at a Study Group Meeting in ESL on 24 November. A report is in preparation.

3. MEDIUM-RANGE LOCATION OF AIRCRAFT-LAID MINE ENTRY POINTS

a. Sound-Ranging

The underwater sound studies have been only slightly advanced by further recordings in connection with air-laid mine drops on 21 October, and 3 December. Some information on the underwater sounds from low-flying aircraft was obtained incidentally on one occasion. The hydrophone array, not sufficiently complete for sound-ranging, remains in the west channel at Beavertail, and the electronic equipment associated therewith in Building T-21, Fort Burnside, is being kept in readiness for later operations. A full report on work during the summer has just been issued (see Annex C). A seminar on this sub-project was led by Dr. A. Patterson, Jr., at a Study Group Meeting in ESL on 17 November.

b. Sono-Sono Spotting

This is the sub-project under development by sub-contract with Melpar, Inc., referred to in the Summary Report as having resulted so far in a somewhat too-complex gadget, not yet ready for test.

4. MEDIUM-RANGE LOCATION OF PLANTED MINES

a. Leader-Locator Cables

A small amount of additional field work on leader-locator cable has been completed. This included

measurements of relative phases at two points in the pseudo-channel area and measurements of signals from boats (retriever, L-boat, and buoy boat) moving on the surface and thus representing smaller sneak craft wholly submerged. The cables remain on the bottom for occasional tests of the survival value of the deliberately temporary installation put down last May. The rest of the effort in this sub-project has been in reduction of data and preparation of the final report, not yet ready for distribution. Dr. Evett attended a meeting on U.E.P. matters in Washington on 11-12 December at which this work was mentioned, though no formal paper was presented.

b. Sonar Search Gear

(1) No field work on boat-borne sonar has been done during the quarter. Report on all local field work in this sub-project will soon appear. An evaluation of small and light sonar gear for mine-hunting in comparison with larger and heavier gear now standardized for AMS or AMC(u) installations appears desirable and a recommendation in this connection has been made (see Annex C). A seminar on this sub-project was led by Dr. J.K. Major at a Study Group Meeting in ESL on 10 November.

(2) It has been decided not to install at Beavertail the upward-directed transducer purchased for test of

one or more elements of a sonar fence against swimmers and sneak craft and delivered during the quarter. During the quarter Dr. Andrew Patterson, Jr., was able to attend the Eighth Underwater Sound Symposium in New London, Connecticut, on 19 and 20 November, and contributed to discussions of pertinent papers.

5. SHORT-RANGE LOCATION OF PLANTED MINES

a. Short-range mine locators using electromagnetic signals of any type have not been tested further. It is proposed to evaluate such locators in general terms, with realistic assumptions as to range for detection and of various probabilities for detection and identification, so as to permit judgments as to operational factors of existing or proposed locators without extensive (and often ambiguous) field testing.

b. Location by Horizontal Nets

A small effort on design of horizontally stretched underwater nets of cheap and light materials as mine-laying indicators has been completed and indicates that such nets may be economical safe-guards in sheltered areas where mines would be most unwelcome and most difficult of location by other means. Such indicator nets should be actuated by submarine and surface laid mines as well as by air dropped mines.

6. NAVIGATION OF MINE-COUNTERMEASURES VESSELS

a. Accurate navigation has had no recent field testing under the Contract except that photographic tracking of boats operating over leader-locator cables, or near pressure gauge arrays has been tried with somewhat promising results. It will be easy by such means to evaluate navigational tests from shore stations without interfering with ship or boat operation and even without the knowledge of navigators. This would be rather convenient in harbors not patently under friendly military control. Studies on the type and magnitude of errors in position associated with various navigational methods in restricted waters have continued, and a useful summary report is nearly complete.

7. ACTUATION OF MINES BY SHIP-SIMULATORS (PRESSURE-MINE SWEEPING)

a. Vertical Vortex Sweep

Work on this sub-project has been at a low level due principally to a temporarily disabling illness of Dr. M.L. Wiedmann. The report on the progress to date, all on models, is nearly complete.

b. Bubble Sweep

Recommendations have been made by a sub-contractor's report proposing a larger model of a bubble sweep (see Annex C). A seminar on this sub-contract

was led by Dr. A.A. Evett at a Study Group Meeting in ESL on 22 December. A paper by Dr. Evett on the mathematical theory of bubble sweeping is completed but not yet issued.

c. Pressure and Flow Measurement

Pressure and flow relations at the bottom of a channel when a vessel passes through it are still under study near the north end of Conanicut Island just south of the ship channel to Quonset Point. The basic installation of pressure gauges was laid out on 9 November and relaid, with changes, on 17 November. Three gauges were buried in the bottom in the range of 0-to-5 feet for an M.I.T. research program (under Dr. D.W. Taylor). Signatures of a few widely differing vessels, crash boat to aircraft carrier, have been obtained, but the primary purpose of the set-up cannot be made good until several flowmeters, still in the shop, have been completed and calibrated. Meanwhile, some interesting data on short period seiches (period of the order of 20 minutes) have been obtained. The installation is at the boundary of the largest open water in Narragansett Bay and it is at least theoretically possible to correlate amplitudes and periods of seiches with wind and tidal conditions. The instrument house, at an abandoned cable crossing,

has required a small amount of repair, including watertighting of the roof.

8. NEUTRALIZATION OF MINES

a. Mine Interceptors

The testing of mine interceptors for maintenance of (random) positions on the bottom has been transferred to the Hudson Laboratories of Columbia University. The MINT bed in the West Channel at Beavertail has apparently been permanently lost, but about half of the model devices (inert) remain and have been sent to Dobbs Ferry for planting next spring.

b. Identification of Mines

(1) Television equipment has been sent to another interested group at the Diving School at the Naval Gun Factory. A seminar on this sub-project was led by Dr. M.S. Malkin at a Study Group Meeting in ESL on 3 November.

(2) The possibility that special weapons (nuclear explosives) may be used in harbors with, or separately from, mines has led the Study Group to initiate studies which are beyond the classification limit of this report and will therefore not be reviewed herein.

9. LONG-RANGE TRACKING OF MINE-LAYERS (NEW)

Study Group results already indicate that long-range tracking of potential mine-layers may be a requisite part of any acceptable system of harbor defense.

Visits and discussions have been and will be valuable in exploring this idea. An example of a discussion of this kind is the seminar on long-range detection of submarines led by Dr. W.A. Nierenberg at a Study Group Meeting in ESL on 1 December.

10. SYSTEMS (NEW NUMBERING)

(1) The Study Group is, at the end of the quarter, nearly ready to make a fairly comprehensive report on the systems of harbor defenses of greatest probable interest.

(2) A thorough study of the types and numbers of cargo ships available to friendly forces in any probable war requiring great logistic effort has been prepared by Captain C.H. Dench, USCG (ret), and is nearly ready for distribution. Its bearing upon general counteraction against heavy mining of harbors is sufficiently obvious, since all studies of mine warfare must consider the attrition and replacement of cargo-carriers.

ANNEX C

ESL Technical Reports and Memoranda

TM 21 - Jackson, R.W., "Notes on the Analysis of Low-Frequency Ambient Signals", (ESL:521:Ser.5) dtd 4 November 1953.
UNCLASSIFIED

TM 22 - Evett, A.A., "Report on Emhart Progress Report", (ESL:424:Ser.002) dtd 31 December 1953.
SECRET

TM 23 - Withington, Virginia, "Raydist Radio Ranging in Navigation of Small Craft", (ESL:640:Ser.452) dtd 31 December 1953.
UNCLASSIFIED

TR 19 - Patterson, A., Jr., "Study of Air-Laid Mine Water Entry Disturbances", (ESL:570:Ser:0123) dtd 17 November 1953.
CONFIDENTIAL

TR 20 - Watson, W.W., "Splash-Locator for Visual Minewatching", (ESL:540:Ser.041)dtd 24 November 1953.
CONFIDENTIAL

TR 21 - Foster, Donald, "The Effect of Errors of Curvilinear Coordinates on the Error of Position of a Point", (ESL:590:Ser.16) dtd 31 December 1953.
UNCLASSIFIED

Special Reports

McKeehan, L.W., Memorandum Concerning Program Contract Nonr-609(02), (ESL:100:rl, Ser. 00641) dtd 18 November 1953.
SECRET

McKeehan, L.W., Letter to ONR, Sonar Search Gear-Minneapolis-Honeywell Regulator Company, (ESL:100:pd, Ser.0647) dtd 16 December 1953.
CONFIDENTIAL

McKeehan, L.W., Letter to ONR, Beavertail Laboratory Residual Program, with Recommendations for Further Work on Sound Ranging, (ESL:100:rl, Ser.0413, w. encl.) dtd 24 December 1953.
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ANNEX C

Special Reports (Cont.)

McKeehan, L.W., "Progress Report, Contract Nonr-609(02) covering the period 1 October 1953 to 31 December 1953" (ESL:100:Ser.0695) dtd 31 December 1953.
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